POPULAR
Computing
WEEKLY

12 August 1982 Vol 1 No 17

35p

Street Alley on Vic 20

Psion tapes

ZXucation

Programmable character generator

Swamp for BBC

Spectrum moving patterns

POPULAR Computing WEEKLY

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How to submit articles
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All submissions should be typed and a double space should be left between each line

Programs should whenever possible be computer printed

At present we cannot guarantee to return every submitted article so please keep a copy

Accuracy
Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish although we will always try our best to make sure programs work

This Week

Editorial

The government's scheme to put a micro in every primary school in the UK is a laudable idea (*PCW* August 5) though a scheme to put five or 10 micros in every primary school would have been better

But there is one part of the scheme that strikes a discordant note For a school to qualify under the scheme it must choose from one of three different micros — Sinclair s 48K ZX Spectrum, Acorn s BBC micro model B and Research Machines 480Z

Microcomputer manufacturers were not invited to tender for the scheme The government also failed to produce a list of specifications that manufacturers had to meet in order to be placed on the approved list

Instead, three micros were selected ' using the experience of the education departments microelectronics programmes and with advice from educational advisers'

The scheme has undoubted benefits for the chosen manufacturers Apart from a potential market of 27,000, there are incalculable advantages in familiarising future generations with a particular manufacturer s machine

Micro manufacturers not on the approved list have reason to feel dissatisfied with the government

Next Week



Repel waves of fighters in Alien Attack, a 1K machine code game for ZX81

Classified



BBC MICRO

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Adams is first with Spectrum Ram converter . . .

HARDWARE specialist Stephen Adams has designed a Spectrum 81 converter that enables a 16K Ram pack to be added to a 16K ZX Spectrum giving 32K of memory.

The converter will also allow the Spectrum to use most of the ZX81 peripherals which operate in the top 32K of memory.

The converter costs £7 and will be on display at the ZX Microfair in London on August 21.

Enquiries to Stephen Adams, 3 Leswin Road, London N16.

. . . plus add-on Ram from DK 'Tronics

DK 'Tronics has produced the first add-on Ram board for the ZX Spectrum.

The unit converts a 16K Spectrum into a 48K model in the same way as the official Sinclair Ram board.

The 32K board costs nearly £20 less than the Sinclair equivalent and, unlike the official board, it can be fitted by the purchaser.

David Helas of DK 'Tronics said: "There is no need to send your Spectrum anywhere. Fitting the board is ridiculously sample."

The company has no plans to produce boards with more than 32K. Says David Helas: "48K is a good size. With the micro floppys on the way there will be no market for larger boards."

The 32K add-on costs £39.95 (plus £1 p & p) and is available either at the 4th ZX Fair or from DK 'Tronics, 23 Sussex Road, Gorleston, Norfolk.

4th ZX Fair due in two weeks

FINAL preparations are under way for the 4th ZX Fair at the New Horticultural Hall, Greycoat Street, London SW1 on Saturday, August 21 (10 am-6 pm).

Over 120 exhibitors will be there and organiser Mike Johnston is confident that it will be a success.



The Colour Genie: 16K Ram, 16K Rom for £199

Colour Genie for mid-September

THE successor to the Genie will arrive in the UK next month.

Costing £199, the new Colour Genie features 16K Ram, 16K Rom, eight colours and three sound channels.

The machine, manufactured by Eaca International in Hong Kong, will use a Basic version similar to that on the current Genie and software will be compatible.

The 40 × 24 character display can be programmed to produce 160 × 80 hi-resolution graphics.

Up to 16 colours can be generated by programming and in addition to the 128 alpha numeric characters there are 64 pre-programmed and 128 programmable graphics characters.

The Colour Genie has twin parallel ports, programmable serial port and provision for a plug-in games cartridge. Bug-Byte have been commissioned to write software for the new micro.

The machine is expandable with a plug-in 16K Ram cartridge. Discs will follow — hopefully to be demonstrated at the *Personal Computer World* Show in September.

Lowe Electronics are the sole importers of the Colour Genie. Robert Stead, head of their Computer Divison, said: "We already have several thousand orders and we are hoping for great things from the product."

Initially the machine will be sold by mail order and through existing Genie retailers.

Contact Lowe Electromes, Chesterfield Road, Matlock, Derbyshire.

Tangerine have a Tigress in their tank

TANGERINE has announced that its new Tigress TD 3000 microcomputer will be launched in mid-October.

The triple processor machine will sell in two forms.

The basic Tigress with 64K of program Ram and 96K of dedicated graphics memory will cost £395.

A more advanced machine incorporating a hi-resolution colour monitor and twin double-sided double-density disc drives will probably cost a further £2000.

It will be possible to upgrade the basic Tigress.

Both machines are based around the Z80A processor and use a 6809 chip to handle the input/output routines and a third processor to run the screen graphics.

Artist's impression of the Tigress

The two versions run a modified version of Microsoft 2.2 Basic.

The Tigress TD-3000 is supplied with a full size keyboard, Centronics and RS232 interfaces, Prestel Modem (with built-in auto-dialer), cassette interface, partial Ram battery back-up and light pen and networking ports.

Apple acts to halt sales of illegal micros

APPLE has acted to stop the illegal manufacture of look-alike Apple micros by two Hong Kong companies.

In law suits brought against the two companies, Apple Computers allege infringement of its trade marks, patents and copyright.

The counterfeit micros, almost indistinguishable from real Apple II machines, are apparently being sold in Hong Kong for as little as £300. This compares favourably with the price of the official Apple II of about £840.

For every genuine micro sold, about ten copies are bought. It has been estimated that the output of these clandestine back-street businesses could be as high as 5000 per month.

The patents claimed to be infringed relate to the colour video unit. Apple also claim that copyright of its logo and instruction manual have been infringed.

This initial action is seen as the first of a series of moves to halt the flood of copied micros from over 50 illegal assembly companies.

Although Apple is seeking damages related to lost revenue and seizure of the offending machines, the main purpose of the court action is to prohibit the copying.

These moves come as Apple — facing stiffer competition — announced encouraging third quarter financial results.

Commodore joins classroom battle

COMMODORE are to set up their own Educational Unit to encourage the use of Pets and Vics in schools.

This move comes as a reaction to their exclusion from the government's "Micros in Schools" grants scheme.

Graham Sullivan will leave his appointment as headmaster of Lowbrook Primary School to head the unit in September.

A spokesman for the American company said: "The unit will further our educational interests. Already there are more Commodore machines in schools than any other micro."

Letters

write to Letters, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2

When 16K is not OK, OK?

I would like to draw your attention to what may be quite a frequent occurence.

I recently received the ZX Spectrum I ordered but whereas I had paid for a 48K machine I found out, quite by accident, that 32K of it was missing.

I had attempted to enter

```
DIM A$ (10000)
```

This gave an out-of-memory error. When I rang Sinclair they told me to enter the following command. It may be worthwhile trying this just to make sure you've got a 48K machine.

```
PRINT PEEK 23733/4—15.75  K
```

If you have paid for a 48K Spectrum and you get the answer 16K (or as I got 16.25K) then you either have a faulty machine or you have been sent a Spectrum with only 16K.

David Powell
129 Chestnut Grove
Balham
London SW12

And three hours use is not OK

I ordered my Spectrum on May 8 and it arrived on July 7.

I used it for three hours that evening and the following morning after two minutes use, the screen went blank and smoke appeared from the rear. It is now on its way back to Sinclair.

Is this a record?

Malcolm Mitchell
Flat 3
122 Queens Road
Bury St Edmunds
Suffolk

And a Rom bug is not OK!

Prepare yourself for a shock. Sit down and have somebody nearby ready to telephone for an ambulance! There is a *BUG* in the ZX Spectrum Rom!

You don't believe me? OK this will prove it. Type a short program. Type in a line number one bigger than the last line of the program (for example if the program ends at line 100 type in 101). Now press Edit.

Yes, the last line comes down, but *so does the program cursor*. Well that just about wraps it up doesn't it? Sinclair Research in liquidation? Clive driving a mini? No — it is still a great computer.

Paul Harrison
77 Burnt Oak Lane
Sidcup
Kent

Just keep soldering on

Like Noorel Harque (Peek and Poke, *PCW* July 15) I also had the problem of a loose power jack plug on my ZX81. The solution I found is very effective and simple if you have a soldering iron.

Remove the upper half of the case to expose the printed-circuit board. Cut or de-solder the jack plug from the power lead and thread the lead through the socket. Gently pull the two socket clips upwards and pull the leads past them.

The leads can be stripped of insulation at the ends and soldered onto the clips. Make very sure that the positive lead (striped black and red or in some cases black and white) is connected to the right-hand clip (which would normally contact the jack-plug tip) and that the plain lead is connected to the left-hand clip.

Note however that this procedure will render your guarantee void but it solves the problem and is much more secure than using anything else such as crocodile clips.

When the jack plug has been removed and before the leads are soldered to the ZX81, is a good time to fit an on/off switch into the power lead. This should be fitted between the power pack and the ZX81 and *not* between the power pack and the mains.

I also wedged a small piece of rubber into the socket alongside the power lead so that if the wires were accidentally pulled this would take the strain rather than the solder joints.

Jason Lowe
26 Spring Street
Rishton
Hyndburn
Lancashire

Yes . . . we all have our faults

I have just received my BBC Micro Model B and wonder if anyone else has the following novel fault.

The screen is occupied by one dot per character ie a matrix of 40 x 25 dots whenever Mode 7 (the teletext-compatible one) is called. This matrix can however be overwritten in Mode 7 (a bit confusing) and disappears in all other Modes.

I tried your Open Forum Ski Run (June 24 page 12) program and wonder when you are going to publish the rest of the program since line 610 is clearly not the last line needed. Are these the missing lines?

```
620 IF INKEY$=   THEN GOTO 620
630 ENDPROC
```

I would like to congratulate you on the Saturn program in the most recent issue, it well deserved the Best Program!

Dr David Taylor
1 Elmsway
Bramhall
Stockport

These lines for Ski-Run will work. Our apologies for the omission.

Some have many faults

As a dissatisfied Sinclair user I was interested in the letter from Sinclair Research (*PCW* July 8) which stated that 'no ZX81s with faulty Roms were shipped to customers after July 1981'. I received a ZX81 that thought SQR 0.25 was about 1.3 in June 1982. The machine and 16K Rom pack were ordered at Christmas 1981 and the micro arrived in January 1982. Attempts to use FOR/NEXT loops caused a crash. The ZX81 was returned to Sinclair.

I received a Ram pack. When the ZX81 came back I could never enter more than 25 lines of a program with the Ram in without crashing. The Ram pack was returned to Sinclair.

I discovered SQR 0.25 was not 0.5 in June 1982. The ZX81 was returned to Sinclair.

Third ZX81 and second Ram pack received. The system crashed repeatedly as before. The Ram pack was returned to Sinclair accompanied by a request for my money back.

Presto! Sinclair have not been able to trace my orders or any record of my returns!

At no time have I received any technical advice or help from Sinclair Research, despite writing to describe the faults on each of the five returns I have made.

Sinclair has had my money since Christmas and at no time since have I had a working combination of ZX81 and 16K Ram pack.

You won't find me buying a Spectrum!

G D Pearce
5 Orchard Lea
Coxley Wick
Wells
Somerset

But finally someone's happy

Please continue your slot devoted to the ZX Spectrum as I use all the programs for my Vic20 with a Super Expander Cartridge. The programs are easily converted and work well.

But please could you have a corner devoted to the Vic20 for people with this cartridge as I think that the manual supplied by Commodore for it does not explain fully the art of programming hi-resolution graphics.

Giles Archer
Fernside
Maesmaur Road
Nr Westerham
Kent

We shall continue to publish the Spectrum page. There are no plans at present to have a Vic20 page but we shall of course continue to print articles and programs for the Vic20 as at present.

Street Alley

**A new game for Vic20
by Robert Maydew**

London has been devastated by a nuclear war Most of the population died in the blast, or from the radiation poisoning that followed

The survivors have formed themselves into a number of small close-knit, gangs that compete with each other for what little food remains The rule of law has broken down Only the gangs remain

Each gang controls a well defined area of territory Outsiders who trespass on a gang's "patch" are killed without compunction It is a dog eat dog world

But, in a bid to stop the endless feuding the gang leaders agreed to hold a meeting amid the ruins of Wembley All the gangs attended unarmed and under a flag of truce

However, just when it seemed that a peace treaty would be signed, Chris Tanner leader of the Wembley Warriors, was assassinated Suspicion immediately fell on you and your gang the Snow Hawks because a Snow Hawk knife was found in the body

In fact, it was a set up Tanner was killed by his number two Duncan Kelly who wanted supreme power over all the London gangs

With the other gangs united against you under the nefenous Duncan Kelly you must fight your way back across London

But there are a number of hazards to be overcome Armoured cars driven by crazed gang warriors will mow you down unless you can dodge them There is a polluted river that can only be crossed by jumping from one log to another Falling off a log or crashing into the river bank will prove fatal

The object of the game is to get five of your men into the man holes at the top of the screen

The Snow Hawks will follow you unquestioningly but you will have to exercise all your skill to return home safely Press any key to start

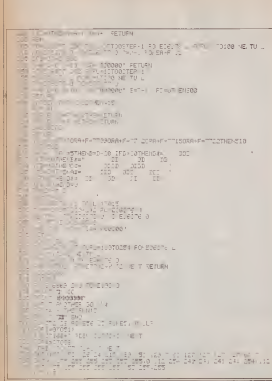


```
   PRINT"3" POKEA+F 0
   A$="DDDDDDDDDDD
   B$="DDD   DDDD   DDDD
   C$="DDDDDD     DDDDDD
   D$="DDD        DDD
   E$="ABC ABC    ABC ABC
   F$="ABC     ABC     ABC
   G$="ABC    ABC    ABC ABC
   FORI=1TO21
   PRINT"DDDDDDDDDDDDDDDDDDDD"
   PRINT
   PRINT" LEFT$(C$,4) RIGHT$(A$,1) LEFT$(A$,CC-I
   PRINT" LEFT$(C$,6) RIGHT$(B$,CC-I) LEFT$(B$,I
   PRINT" LEFT$(C$,8) RIGHT$(C$,I) LEFT$(C$,CC-I
80 PRINT" LEFT$(C$,10) RIGHT$(D$,CC-I) LEFT$(D$,I
   PRINT" LEFT$(C$,14) RIGHT$(E$,I) LEFT$(E$,CC-I
85 PRINT" LEFT$(C$,16) RIGHT$(F$,CC-I) LEFT$(F$,I
85 PRINT" LEFT$(C$,18) RIGHT$(G$,I) LEFT$(G$,CC-
90 PRINT" SC TI$
91 IFPEEK(A+F)=4ANDC<5THENGOSUB200
95 IFPEEK(A+F)=32ANDC<5THENGOSUB250
100 IFTI$=>"000030"THENGOSUB300
110 IFC<5THENGOSUB400
115 POKEA+F,32
120 IFC=10THENGOSUB500
125 GETL$:IFL$="@"THENA=A-44:C=C+1:SC=SC+10
130 IFL$="/"THENA=A+44:C=C-1:SC=SC-10
135 IFL$=","THENA=A-1:N=N-1:IFN=0THENGOSUB200
140 IFL$="."THENA=A+1:N=N+1:IFN=21THENGOSUB300
145 POKEA+F,0:POKEOF+A,3
150 FORU=1TO100:NEXT
155 NEXT
160 GOTO50

200 IFTI$="000020"THENGOSUB...
205 IFC=6THENA=A-1:N=N-1:RETURN
210 IFC=7THENA=A+1:N=N+1:RETURN
215 IFC=9THENA=A-1:N=N-1:RETURN
```

to next page

Street Alley



```
[illegible] RETURN
[illegible] REM
[illegible] TO0STEP-1 [illegible] :NEXT [illegible]
[illegible]
[illegible] 00000" RETURN
[illegible] TO0STEP 1
[illegible] NEXT [illegible]
[illegible]
[illegible] 0000" [illegible]
[illegible]
[illegible] +15
[illegible]
[illegible] RETURN
[illegible] RETURN
[illegible]
[illegible] ORA+F=[illegible]ORA+F=[illegible]ORA+F=[illegible]150RA+F=[illegible]THEN510
[illegible]
[illegible] =5THEND=D-10 IFD=10THEND$= [illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible] RETURN
[illegible]
[illegible] ANOTHER GO [illegible]
[illegible] THE END
[illegible] END
[illegible] 255 [illegible]
[illegible] 255 255 255 255 [illegible] 255 [illegible]
[illegible] 255 255 [illegible] 255,255
```

All's fair in Manchester and Edinburgh

***PCW* stsff** *report on the Manchester and Edinburgh micro fairs*

Over 4000 visitors found their way through Manchester's decaying warehouse wastelands to the city's Microfest 82.

Held at UMIST on July 24 and 25 there were more than 70 exhibitors and continuous lecture and film programmes.

Interest for the home micro owner centred on equipment for the Sinclair ZX Spectrum. Both Fuller Micro Systems and Kempston (Micro) Electronics displayed add-ons for the Spectrum — a sound box and a mother board plus I/O port respectively. Spectrum software was also on display at the Richard Altwasser stand.

Microfest organisers David and Mike Hewitt were more than pleased with the show. Said Mike: "The whole event has been a tremendous success."

David was surprised at the differences in the audiences for the two days. The Sunday crowd was more business oriented while the home micro enthusiasts tended to come on Saturday.

It is unfortunate that micro events seem to come in pairs. Those who attended the Manchester Microfest in preference to the Edinburgh ZX Fair salved their consciences by crossing the road to the nearest public house — The Swinging Sporran.

During the course of the two-day Microfest a series of lectures were presented.

Alan Shaw (St Martin's College, Lancaster) spoke on *Computer Interfacing for Experiments*. He explained the basic stages in the construction of a ZX81 input/output interface. He also demonstrated how to select the pins for the parallel I/O organiser, how to calculate their



A study in concentration ... at Manchester



Paul Kriwaczek: Will the alienation of ourselves from each other and from nature be solved by computers?

addresses ehd how to set up a simple control device. The device enabled him to use a ZX81 to start and stop a model electric car.

Boris Allan (Senior Lecturer in Sociology, Manchester Polytechnic) tackled *The BBC Computer in Education*. He put forward his philosophy: "Ignorance of computers is not a crime; to be ignorant of computers can be a disadvantage; understanding computers requires no special type of ability and everybody has to start somewhere."

Boris felt that the emphasis of computer education should be placed on computer awareness for everyone rather than computer studies for the few.

Paul Kriwaczek (producer of the BBC tv series *The Computer Programme*) posed the question *Is Computer Literacy Really Necessary?*

"No other new technology has ever been introduced with such a fanfare," he said. "In its time the motor car was every bit as significant a development — but there was no government department set up to give us 'car awareness'.

"People saw for themselves that the car was a good idea. Why are computers different? And why invoke this emotive phrase 'computer literacy'? The impression is given that — come the computer revolution — everything will be all right.

"Like other faiths you do not ask for evidence. Nobody asks how the computer is going to solve the problems in our society. Will the alienation of ourselves from each other and from nature, to say nothing of our rampant materialism, be solved by computers?

"People believe that computers will be the answer because they do not understand them. Computer literacy should give us this appreciation and therefore allow us to make the most of micros."

Stephen Adams (specialist hardware writer) delivered two lectures. *Inside the Spectrum* toured the printed-circuit board of the Sinclair micro. *Keep It Simple* explained how to begin programming and how to make your programs easily understood by others.

Eric Deeson (Educational ZX User Group) looked into *The Future of Micros in Schools*.

"To get one computer in a school is not the end of educational computing — it is the beginning," he emphasised. "The trend towards cheap powerful micros will enable schools to take a more liberal approach to micro education.

"What is needed," he said, "is computer-aided freedom rather than the 'battery farm scenario' with children in computer learning cubicles. The micro must open our educational horizons rather than restrict them."

Edinburgh ZX Computer Fair

The first true home computer exhibition in Edinburgh was an undoubted success. Nearly 1200 visitors attended the show which was organised by Gordon Hewitt and the Edinburgh ZX Computer Club.

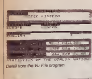
The exhibition was set in the long concrete reception hall of Edinburgh's Meadowbank stadium. The local club took a large stand at one end of the hall. The rest of the exhibitors were arranged in a neat line of tables extending about 60 yards down one side of the hall, leaving plenty of space for the visitors to mill around.

The main interest seemed to focus, understandably, on the ZX Spectrum. Those companies displaying the first Spectrum programs did particularly well, certainly in drawing a large crowd of permanent hangers-on. The Bug-Byte Space Invaders program was the most popular draw.

We had a Spectrum on the *Popular Computing Weekly* stand. It drew a crowd of young enthusiasts, each berating the others' ability to program it properly. Many people actually tried to buy our only copy of the manual.

One woman complained: "But I need another copy. My dog buried mine somewhere in the garden. He is always burying my books. Normally I know where he's put it but this time I have had to give up. It's probably too late now. Next time I'll wrap it in polythene."

The imaginative organisation of the show by the Edinburgh Club — competitions ran the full length of the exhibition — kept many of the visitors right to the end. It proved quite forcefully that there is a stronger home computing following in Scotland than is often assumed. The organisers hope more software and hardware companies in this business show their support.



Detail from the Vu File program

Detail from the Backgammon program

Sinclair/Psion Tapes

Sinclair Research Camberley Surrey and branches of W H Smith
ZX81 16K cassettes

Psion are the second software house to sign an exclusive deal with Sinclair

Five of the tapes are games two of these produced by Microgen under the Psion banner and the packaging is eye-catching

Chess (£6 95) one of the Microgen tapes has had £3 clipped from its previous price There are six levels of play in the program and these may be changed in mid play The board may also be set up for problem solving All legal moves are recognised A good solid program The tape includes a chess clock on Side 2

Space Raiders Bomber (£3 95) is the other Microgen tape *Space Raiders* is you guessed it! Yawn Not even a mother ship to relieve the boredom *Bomber* (or *New York* as Microgen call it when they sell it direct) is the well-known sky scraper demolition program This is a very addictive game Please let me know if you succeed in landing your plane — I ve not seen it done yet even though upwards of 300 kids tried it at the local school fete!

The rest of the programs are Psion s own products a couple of which were available before the Sinclair connection

Backgammon (£5 95) is the only program I know of which plays my favourite board game and so was a must when I saw it advertised some months ago It has since undergone a tidying up operation with response times being made faster Like all Psion programs it has great visual appeal Below the board in the accompanying illustration are the dice and between them a box which shows the moves made by computer and human opponent On the bar you can see the doubling cube which the program is intelligent enough to offer at the right moment

While the program will execute all the recognised openings I am a little worried at its tendency to blot with its back men after only two or three throws which leads to a game of boring attrition This happens in my experience once every four or five games but it is easy to break the game and start again All in all however a very good program and a very rewarding one

Sorcerer s Island Perilous Swamp (£4 75) are the games on the other previously available tape and are very good value *Perilous Swamp* contains a Princess which the player has to rescue and escort to safety It s really more of a board game than an adventure but along the way you will meet various monsters and pick up bits of treasure or weaponry with which to bribe or fight them

Sorcerer s Island is a graphic adventure in which you take a Sunday morning stroll around a paradise island Uneventful of course apart from the giant rats minotaurs and so on! Again you can bribe or fight or run away Reaction times are a little slow but a nice scrolling technique helps relieve any boredom I ve played the game for a year and still not succeeded in finishing it.

Flight Simulation (£5 95) is the final games tape in this package from Psion No words can do justice to this most elegant of programs — in my opinion the best use of machine-code yet available for the ZX81!

You are placed in the pilot s seat of a twin-engined prop plane somewhere near a landing strip and your job is to land safely There are several modes but they all feature the same cockpit display of altimeter rev counter and so on together with a view from the cockpit window This shows the horizon which will show the degree of bank and rate of climb or descent This is all depicted in a most realistic way

To help you find the runway you may call up a map and this together with several beacons will guide you to the final approach At this point you may ask for a visual approach and this will consist of a 3D representation of the runway and approach lights As in real life an eye must be kept on wind-speed and the plane kept from stalling

Vu-File and *Vu-Calc* (£7 95 each) are the two remaining Sinclair Psion programs

As its name suggests *Vu File* is a data filing and retrieval system The difference between this and the multitude of others available is that Psion has examined systems run on the larger micros and compacted the design to fit into the ZX81 at the same time continuing their policy of elegant and attractive graphics

One is able to format the file to any degree with graphic borders and so on Forward planning is required in this formatting — it cannot be altered during data input Once data is input there are a number of powerful commands to use in processing the information For example the user can initiate a search which will print out a specified field in alphabetical or rank order In the demonstration file containing information of the world s countries for instance all the records may be listed in say population order or to show every occurrence of a particular language Thus one can quickly find which countries speak Bantu and which ones use Pound Sterling and so on Using the system at home one could find and print out every record say with a particular bass-player or every stamp with a blue flower in the design

Commands include an analysis of memory remaining while inputting data and a copy to-printer routine

The companion tape to *Vu-File* is *Vu Calc* As its name suggests it is a ZX81 version of Visicalc Necessarily limited by the 16K Ram it is nevertheless a very useful cash forecast system for the home user or the one-man-businessman who has not yet Appled

The program acts as a window on to 936 boxes which can be filled with numerical or alphabetical data Formulae can then be applied to these data in many different ways The user can define the horizontal rows as for instance mortgage rates gas electricity etc and the vertical rows as January February and so on Data for the various months may then be input and the formulae set The totals will be displayed in the boxes chosen Any data may then be changed and the effect on the whole noted

Summary

The Psion tapes are a welcome change from the usual run of Sinclair Software (from any source) All are good value but I would single out *Flight Simulation* for special mention — you will not see a better games program until Psion create one for the Spectrum *Vu-File* and *Vu Calc* are a brave attempt to emulate much more expensive packages and certainly succeed as far as is possible on the Sinclair

TB

Reviews
hardware



Character Generator

Haven Hardware, 4 Asby Road, Asby Workington Cumbria
Price £19 95

This board allows you to use the inverse character (usually white on black) of your ZX80 or ZX81 to program your own character set

The ZX character set is made up of characters each with one byte (memory location) width and eight bytes length Each byte contains eight dots which can be ones or zeros giving either black or white dots

With this board any of the 64 characters can be changed by Pokeing the appropriate dot pattern into the various bytes that make up that character On this board there are two inverse character sets and using Poke commands you can alternate between them Unfortunately there is no way to restore the original Rom-based inverse character set when using this board

The board can be connected quite easily to the ZX80 by plugging in a ribbon strip and plug into the Rom socket and transferring the Rom to a similar socket on the characters board There are five other wires to solder on to the printed-circuit board and this can be quite difficult as the connections have to be made to both sides of the printed-circuit board

On the ZX81 the fit is very tight because it was not possible to connect the board as suggested since that would have involved obstruction of the tape sockets An attempt was made to take it out the other side of the ZX81 but then the case would not fit on In the end, since the board is too big to fit under the ZX81 keyboard, the case had to be left off in order to use it The wires for the rest of the connections had to be traced out on the printed-circuit board as the diagram was rather imprecise

On switching on you are presented with a random pattern of dots instead of the cursor The normal characters come out the same but as the inverse character set has been replaced with Ram all the mode characters are lost (inverse L K G)

A program is provided to revert to the normal character set by reprogramming the inverse character set — called Inverse into Programs but the instructions fail to mention it Two other programs are included A graph plotter which fails if trying to plot at zero or below and a double-sized character generator which I could not get to work A chart is also provided to help you design your own characters and is about the most useful thing in the instructions

Summary
This board is cheaper than other character sets but I would much rather spend the extra money and have fewer problems
SA

Spectrum 32K RAM

Sinclair Research, Freepost, Camberley, Surrey
Price £60

The Sinclair add-on 32K Ram board for the ZX Spectrum must be fitted by their factory in Scotland so if you wish to purchase this board after buying a 16K Spectrum you must send the Spectrum back with the order

This seems a pity because it is so easy to fit the 6½ by 1½ inch board into the sockets provided on the back part of the printed-circuit board The sockets for the add on board are provided on every Spectrum and it can only be fitted into them one way round The pins on each end of the board are stout and there is little chance of bending them

The board contains eight Ram chips (32K x 1 bit) made by Texas two decoding chips two change-over chips which operate when the dynamic Ram needs to be refreshed and eight small ceramic capacitors to smooth the power supply to the Rams

The decoding is simplified by the fact that only one address line is needed to address all the chips (A15) When this line is Binary 1 then the Ram is turned on There is no need to tell the computer how much memory is available (as on the ZX81) since it is automatically counted from 64K downwards Also, all the Ram can be used for machine code or Basic programs This means that there is no space left for Eproms, ports etc in memory The Rams used on the board are not standard Texas components They appear to be similar to 4164 (64K x 1 bit) chips but only contain 32K Could they have been Texas rejects? Only Sinclair seems to be able to get hold of any

The board works very well and no noticeable increase in heat from the voltage regulator or other signs of overheating have been noticed with it in use The Ram-pack wobble is no longer present as all other equipment is connected to the edge connector and the Ram pack has its own connection sockets and is firmly held

It is not possible to turn off sections of the Ram for more memory or other devices from the edge connector as Ram CS (chip select) is not provided This is a great pity as not everyone wants to be restricted to what the manufacturer wants to provide

Summary
The Ram board is well made and should cause no problems in use However to fix the units the ZX Spectrum must be sent back to the factory This is a great disadvantage as is the price of £60 Other Ram boards are certain to be available soon with at least the same amount of Ram which may provide a Ram CS so that other devices can be used with the Ram pack
SA

Programming ZX81

by M James and S M Gee
Bernard Babani Ltd The Grampians, Shepherds Bush Road London W6 7NF (Tel 01 603 2581)
Available from larger branches of W H Smith
Price £1 95

The Art of Programming the 1K ZX81 is a simple yet professionally produced book of 86 pages At £1 95 its price bears a closer resemblance to normal books than computing books which for some reason are still grossly over-priced

It is a well written and carefully thought out book which does far more than present a sense of 1K games Each chapter introduces and explains a different topic, explores a few ways of using the techniques discussed in simple programs and then helps you build up those programs In this way you usually end up with a couple of games out of each chapter

These include card games in the chapter on random numbers arrow, lunar lander and cannon-ball in the chapters on moving graphics clocks and reaction time testers in the chapter of the use of Fast Slow and Pause and codes and cyphers in the chapter on string handling

There is also an excellent short chapter introducing the Peek and Poke functions This should do much to dispel the mystery for some reason still surrounding these two commands There is also a useful big letters program

Summary
A very useful and well written book which we strongly recommend for new users of the ZX81 It is a pity that the book has arrived on the market so late in the day for the ZX81
DS

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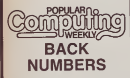
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KEMPSTON (MICRO) ELECTRONICS

NEW

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The Port is built around a M O S chip which imposes virtually no D C load on the datalines. The device is Port Mapped and can be configured in a variety of modes dependent on the particular application. We must stress that this is not a modified ZX81 Port, but a purpose built unit designed exclusively for the Spectrum (16 line I/O port is also available for the ZX81)

The prices for the above items are as follows

ZX SPECTRUM USER I/O PORT	£18.50
ZX 2 SLOT MOTHERBOARD	£16 95
STACKABLE CONNECTOR	£5 50

The prices are inclusive of VAT but postage must be added at 70p for a single item £1 00 for two or more items

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Open Forum

Open Forum is for you to publish your programs and ideas
It is important that your programs are bug free before you send them in We cannot test all of them
Contributions should be sent to Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2H 7HF

How to contribute

Each week the editor goes through all the programs that you send to Open Forum in order to find the Program of the Week.

The author of that program will qualify for DOUBLE the usual fee we pay for published programs. (The usual fee is £10)

Presentation hints

Programs which are most likely to be considered for the Program of the Week will be computer printed and accompanied by a cassette

The program will be well documented, the documentation being typed with a double spacing between each line.

The documentation should start with a general description of the program and then give some detail of how the program has been constructed and of its special features.

Listings taken from a ZX Printer should be cut into convenient lengths and carefully stuck down on to white paper, avoiding any creasing

Please enclose a stamped, self-addressed envelope

Simon

on BBC Micro

Simon is a program to simulate the electronic game of the same name It runs on the BBC Model B and demonstrates some of the interesting colour graphics and sound facilities of the BBC

The program starts by switching off the colours RED GREEN YELLOW and BLUE A circle is then plotted with each quadrant assigned one of the four colours The screen remains blank as all these colours have been turned to black On the issue of a VDU19 command the colours can be turned on and off at will

The computer flashes up a segment of colour accompanied by a sound (each colour has its own sound) You then have to repeat the colour by entering R G Y or B The computer increases its sequence of colours and sounds by 1 until either it

to next page

Simon
by D M Dodsworth

```
  1 CLS
  2 FOR I=1 TO 5:PRINT:NEXT I
  3 PRINT CHP$ 141 "            SIMON" ' CHR$ 141 "
  4 PRINT CHP$ 141 "            =====" ' CHR$ 141 "
  5 PRINT:PRINT " PRODUCED BY: A.K. and D.M.Dodsworth"
  6 PRINT "                 59 Balmoral Drive"
  7 PRINT "                 Bramcote Hills"
  9 PRINT "                 Beeston"
  9 PRINT "                 Nottingham  NG9 3FT."
 10 TIME=0:REPEAT UNTIL TIME=200
 11 CLS
 12 PRINT:INPUT "Do you need instructions (YES/NO)",A$
 13 IF A$="NO" THEN 100
 14 CLS
 15 PRINT:PRINT
 16 PRINT "       INSTRUCTIONS"
 17 PRINT "       ============"
 18 PRINT
 19 PRINT "  This is a computer version of the"
 20 PRINT "popular electronic game 'SIMON'.The"
 21 PRINT "computer flashes a segment of a circle"
 22 PRINT "and plays a note.You must follow it."
 23 PRINT "If a blue segment was shown,type 'B',"
 24 PRINT "for red type 'R',green 'G',and yellow"
 25 PRINT "'Y'.If blue then red were flashed then'
 26 PRINT "type 'BR',and so on.The screen will be"
 27 PRINT "blank for a few seconds at the start"
 28 PRINT "of the game,don't worry.Good luck!!"
 29 FOR Z=1 TO 7:PRINT:NEXT Z
 30 INPUT "       press RETURN to commence"D$
100 DIM STORE(10)
110 MODE 2
120 PROCCIRCLE
130 FOR A=1 TO 10
140 STORE(A)=RND(4)
150 NEXT A
160 FOR A=1 TO 10
170 PRINT TAB(1,29)SPC(20);
180 FOR B=1 TO A
190 TIME=0:REPEAT UNTIL TIME=20
200 VDU19,STORE(B),STORE(B),0,0,0
210 ON STORE(B) GOSUB 330,420,460,500
220 T1=TIME
230 REPEAT UNTIL TIME=TI+50
240 VDU19,STORE(B),0,0,0,0
250 NEXT B
260 INPUT TAB(1,29)"NOW REPEAT ?"X$:
270 L=LEN(X$)
280 IF L=A THEN GOTO 310
285 PRINT TAB(1,30)SPC(20);
290 PRINTTAB(1,30)'WRONG NUMBER OF ENTRIES";
295 TIME=0:REPEAT UNTIL TIME=200
```

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reaches 10 or you fail to respond correctly.

The program is written in a structured manner using procedures and subroutines. The maximum number in the sequence can be increased easily by changing line 160.

O and X Maths

on ZX81

This program is intended to be an exciting game and challenge the mathematical skills of the players. Intended for average primary age children. It is based upon the popular noughts and crosses game. I have tried to make it as simple to operate as possible.

On loading the program will automatically run if SAVEd by GOTO 2000. The two players are asked to type in their names. The screen then goes blank for ten seconds whilst the computer prints the screen and checks the questions it sets at random.

Variables used:

Arrays	N$	Players names — up to 12 letters are accepted and the name is positioned within the middle of the string — by lines 50 and 75 — to produce neater printing
	Q$	Stores the questions. The element is changed to the appropriate symbol for the check routine if the question is correctly answered. If larger questions are set by altering lines 230 and 240 it may be desirable to set Q$ (9 6)
Strings	M$	Players names are input before storing in middle of element of N$ array
	A$	Question numbers are called by touching the keyboard. Only unanswered questions may be called due to the check in line 455
	E$	6 spaces are used to areas print
	R$	Question answer is entered by player
Loops	F	Time loops. It produced a more stable display than PAUSE
	A	Provides PRINT AT points for board in lines 110 to 180. Used to count element of Q$ array in lines 220 to 250
	A & B	Provides relevant letter to print in each box in lines 150-170

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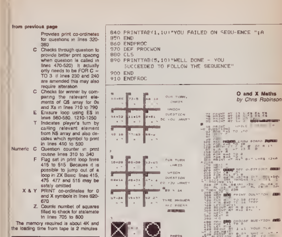
```
296 PRINT TAB(1,29)SPC(20);
297 PRINT TAB(1,30)SPC(20);
298 PRINT TAB(1,31)SPC(20);
300 GOTO 260
310 S=0
320 FOR C=1 TO A
330 GOSUB 540
340 NEXT C
350 IF S=1 THEN PROCERROR
360 NEXT A
370 PROCWON
380 SOUND1,-15,0,5
390 SOUND2,-15,12,5
400 SOUND3,-15,28,5
410 RETURN
420 SOUND1,-12,20,5
430 SOUND2,-12,50,5
440 SOUND3,-12,100,5
450 RETURN
460 SOUND1,-10,50,5
470 SOUND2,-10,100,5
480 SOUND3,-10,150,5
490 RETURN
500 SOUND1,-8,100,5
510 SOUND2,-8,150,5
520 SOUND3,-8,200,5
530 RETURN
540 REM*****
550 REM*SUBROUTINE TO CHECK FOR CORRECT SEQUENCE
560 P$=MID$(X$,L,1)
570 IF P$="P" THEN P=1
580 IF P$="G" THEN P=2
590 IF P$="Y" THEN P=?
600 IF P$="B" THEN P=4
610 IF P<> STORE(C) THEN S=1
620 RETURN
630 DEF PROCCIRCLE
640 REM*****
650 REM*PROCEDURE TO PLOT CIRCLE WITH FOUR COLOURED
660 REM*SEGMENTS - THE COLOUR IS SWITCHED OFF
670 REM*****
680 ANGLE=0
690 MOVE 640,512+400
700 FOR X=1 TO 4
710 GCOL 0,X:VDU19,X,0,0,0,0
720 FOR Y=1 TO 9
730 ANGLE=ANGLE+10
740 MOVE 640,512
750 PLOT 85,SIN(RAD(ANGLE))*400+640,COS
    (RAD(ANGLE))*400+512
760 NEXT Y
770 NEXT X
780 ENDPROC
790 DEF PROCERROR
800 REM*****
810 REM*ERROR SEQUENCE PROCEDURE
820 REM*****
830 CLS
```

from previous page

		Provides print co-ordinates for questions in lines 320-380
	C	Checks through question to provide better print spacing when question is called in lines 470-520) It actually only needs to be FOR C = TO 3 if lines 230 and 240 are amended this may also require alteration
	C	Checks for winner by comparing the relevant elements of Q$ array for 0s and Xs in lines 710 to 790
	E	Erasure loop using E$ in lines 560-580 1210-1250
	T	Indicates player's turn by calling relevant element from N$ array and also decides which symbol to print in lines 410 to 590
Numeric	C	Question counter in print routine lines 310 to 340
	F	Flag set in print loop lines 415 to 515 Becaues it is possible to jump out of a loop in ZX Basic lines 415, 475 477 and 515 may be safely omitted
	X & Y	PRINT co-ordinates for 0 and X symbols in lines 620-670
	Z.	Counts numbet of squares filled to check for stalemate in lines 705 to 800

The memory required is about 4K and the loading time from tape is 2 minutes

```
840 PRINTTAB(1,10)"YOU FAILED ON SEQU-ENCE "1A
850 END
860 ENDPROC
870 DEF PROCWON
880 CLS
890 PRINTTAB(5,10)"WELL DONE - YOU
    SUCCEEDED TO FOLLOW THE SEQUENCE"
900 END
910 ENDPROC
```



O and X Maths

by Chris Robinson

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Grand Prix

on Vic-20

In this game you have to bet on a racing car and then watch the race to see if you win or not The odds for each car change for every race and depending if you have choosen the easy or the hard game you are either told the odds before the race or not

To select a car just enter the first letter — le P for purple — and state your bet. The program is fool-proof so you can't bet more than you got!

The listing is in lower case letters as this is the mode in which the program runs, so capital letters are easier to see for programming

Program notes

Line 110-120 Sets the odds for each race
Line 130 The second print symbol is for cyan (in lower case)
Line 140 The second print symbol is for yellow (in lower case)
Line 211-216 Decyphers which car is

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from previous page

chosen and sets the colour for each car

Line 250 Sets the cars at the starting line

Line 260-310 Decide which cars move

Line 1000-1010 Clears the first car

Line 1030-1030 Pokes the first car to its new position

Line 1100-1440 Same as above but for the other cars

Line 2020-6030 Decides if you've won or not. If you have then works out what you win

It will be noticed during the program that once the race begins, that the race track edge and finish line are the colour of the car you have betted on

```
600 GOSUB 600+T+100
700 REM CHECK FOR WINNER
705 LET Z=0
710 FOR C=1 TO 3
720 IF @B(C)=@B(C+3) AND @B(C) =
@B(C+6) THEN GOTO 1200
730 IF @B(C*3-2)=@B(C*3-1) AND
@B(C*3-1)=@B(C*3) THEN GOTO 100
740 NEXT C
750 IF @B(1)=@B(5) AND @B(1)=@B
(9) THEN GOTO 1200
760 IF @B(3)=@B(5) AND @B(3)=@B
(7) THEN GOTO 1200
770 FOR C=1 TO 9
780 IF @B(C,1)= X OR
  THEN LET Z=Z+1
790 NEXT C
800 IF Z=9 THEN GOT
810 GOTO 560
1000 RE
1070 LET @B(4)= X
```



Grand Prix

by Alan Horrell

```
10 q=36879 v=10 y$="You have won with odds" Pokeq,218 Pokeq-v,242
30 m=102 l=v Print"GRAND PRIXY A.HORRELL" Printtab(7)"
14/4/82
40 Print"Do you want the easier game giving you the odds before each race
50 Print"or will you try the harder game without
60 Print"the aid of odds." Print "K<<<<<< E or H >>>>>>>
80 wait198,1 k=225 s=32 j=97 n=106 o=116 p=22 h=38720 ifPeek(197)=43theneh=1
110 g=rnd(1) i=rnd(1) z=rnd(1) u=rnd(1) y=rnd(1)
120 ao=int(g*v)+1 bo=int(i*v)+1 co=int(z*v)+1 do=int(u*v)+1 eo=int(y*v)+1
130 Pokeq,14 r=r+1 Print" GRAND PRIX RACE"r" " fort=7700to7701 Poket,160
140 Poket+h,3 next Printtab(5)"BET ON A CAR" ifeh=1then200
150 Printtab(4)"White car "ao" 1" Printtab(4)"Red car "bo" 1
170 Printtab(4)"Purple car"co" 1" Printtab(4)"Green car "do" 1
190 Printtab(4)"Cyan car "eo" 1
200 Print "Your credit limit is       £"l
210 Print "Pick a car ", ifeh=1thenPrint"",
211 getc$ ifc$="w"thencb=1 u$="WHITE
213 ifc$="r"thencb=2 u$="RED
214 ifc$="p"thencb=4 u$="PURPLE
215 ifc$="g"thencb=5 u$="GREEN
216 ifc$="c"thencb=3 u$="CYAN
217 ifcb<=0then211
220 Printu$
225 Print"What's your bet £     "  inputw
230 ifw>lthenPrint" BET OUTSIDE CREDIT " gosub500 goto225
245 l=l-w Print"" Pokeq,8 forf=8165to8184 Pokef,111 Pokef+h,cb next
247 forf=7680to8164step22 Pokef,127 Pokef+h,cb next forf=7700to8184step22 Pokef,
255
258 Pokef+h,cb next gosub1020 gosub1120 gosub1220 gosub1320 gosub1420 gosub500
260 x=rnd(1) ifx>zthengosub1200 ifPeek(8174)=mthen4000
280 ifx>ythengosub1400 ifPeek(8182)=mthen6000
290 ifx>gthengosub1000 ifPeek(8166)=mthen2000
300 ifx>uthengosub1300 ifPeek(8178)=mthen5000
310 ifx>ithengosub1100 ifPeek(8170)=mthen3000
320 goto260
500 fort=1tok*v next return
600 gosub500 Print"" return
700 ifl<1thenPrint"YOU ARE BANKRUPT" fort=1tos*o next run
750 Print" Your "u$" car lost" goto9006
1000 Poke7681+a,s Poke7682+a,s Poke7683+a,s Poke7704+a,s Poke7725+a,s
1010 Poke7726+a,s Poke7727+a,s a=a+p
1020 Poke7681+a,k Poke7682+a,m Poke7683+a,j Poke7704+a,m Poke7725+a,n
```

```
1030 Poke38445+a,1 Poke7726+a,m Poke38446+a,1 Poke7727+a,o Poke38447+a,1 return
1100 Poke7685+b,a Poke7686+b,s Poke7687+b,s Poke7708+b,s'Poke7729+b,s
1110 Poke7730+b,s Poke7731+b,s b=b+P
1120 Poke7685+b,k Poke38485+b,2 Poke7686+b,m'Poke38486+b,2 Poke7687+b,J
1130 Poke38487+b,2 Poke7708+b,m Poke38428+b,2 Poke7729+b,n Poke38449+b,2
1140 Poke7730+b,m Poke38450+b,2 Poke7731+b,o Poke38451+b,2 return
1200 Poke7689+c,s Poke7690+c,s Poke7691+c,s Poke7712+c,a'Poke7733+c,s
1210 Poke7734+c,a'Poke7735+c,s c=c+P
1220 Poke7685+c,k Poke38409+c,4 Poke7690+c,m Poke38410+c,4 Poke7691+c,J
1230 Poke38411+c,4 Poke7712+c,m Poke38432+c,4 Poke7733+c,n Poke38453+c,4
1240 Poke7734+c,m Poke38454+c,4 Poke7735+c,o Poke38455+c,4 return
1300 Poke7693+d,s Poke7694+d,s Poke7695+d,a'Poke7716+d,s'Poke7737+d,s
1310 Poke7738+d,s Poke7739+d,s d=d+P
1320 Poke7693+d,k Poke38413+d,5 Poke7694+d,m Poke38414+d,5 Poke7695+d,J
1330 Poke38415+d,5 Poke7716+d,m Poke38436+d,5 Poke7737+d,n Poke38457+d,5
1340 Poke7738+d,m Poke38458+d,5 Poke7739+d,o Poke38459+d,5 return
1400 Poke7697+e,s Poke7698+e,s Poke7699+e,s·Poke7720+e,a Poke7741+e,s
1410 Poke7742+e,a Poke7743+e,s e=e+P
1420 Poke7697+e,k Poke38417+e,3 Poke7698+e,m Poke38418+e,3 Poke7699+e,J
1430 Poke38419+e,3 Poke7720+e,m Poke38440+e,3 Poke7741+e,n Poke38461+e,3
1440 Poke7742+e,m Poke38462+e,3 Poke7743+e,o Poke38463+e,3 return
2000 gosub600 Printtab(6)"██WHITE WINS"
2020 ifc$="w"thenPrinty$ao"█ 1" wi=w*ao+w'goto9004
2030 goto700
3000 gosub600 Printtab(7)'██RED WINS"
3020 ifc$="r"thenPrinty$bo"█ 1" wi=w*bo+w goto9004
3030 goto700
4000 gosub600 Printtab(6)"██PURPLE WINS"
4020 ifc$="p"thenPrinty$co"█ 1" wi=w*co+w goto9004
4030 goto700
5000 gosub600 Printtab(6)"██GREEN WINS"
5020 ifc$="g"thenPrinty$do"█ 1" wi=w$do+w goto9004
5030 goto700
6000 gosub600 Printtab(6)"██CYAN WINS"
6020 ifc$="c"thenPrinty$eo'█ 1" wi=w*eo+w goto9004
6030 goto700
9004 l=l+wi
9006 Print"███Your credit now stands    ██t £"l
9007 Print"██████      Hit any key for another race   "
9020 a=0 b=0 c=0 d=0 e=0 cb=0 Poke198,0 wait198,1'goto110
```

Nottingham Castle

on ZX81

This program illustrates how Breakout and Adventure games can be combined to produce interesting effects.

The aim is to rescue Manon. After knocking four archers off the sheriff's wall he always obliges by indicating roughly where she is locked up.

I have kept it as simple as possible to encourage others to play about with the Sherwood Forest characters.

Line 65 fixes the co-ordinates for the sheriff (3), line 97 for Marion (4), line 87 for the archers (2), line 25 for the bricks (1), line 1520 for the bricks knocked down (0)

Maths Tables

on Vic-20

This program allows the Vic20 to be used as a maths log tables book. It is menu driven to select which tables are required and by inputing the function you want, log, tangent etc, you can find the log or whatever function chosen, of that number. The listing is quite straightforward.

Lines 70-90 Print the menu

to next page

Nottingham Castle

by Nick Willink

```
1 REM [illegible]
2 CLS
3 RAND
4 LET HIT=0
5 DIM C(8,30)
6 LET X=10
7 LET P=INT (RND*8)+1
8 LET SC=0
10 FOR N=4 TO [illegible]
20 FOR M=4 TO 8
22 PRINT AT M,N;CHR$ (136+P)
25 LET C(M,N)=1
27 PRINT AT M,3;CHR$ (184-M)
30 PRINT AT M,27;CHR$ (16+M)
35 NEXT M
40 NEXT N
42 FOR N=5 TO 28 STEP 4
45 PRINT AT 3,N;"█"
47 NEXT N
[illegible]

87 LET [illegible] C2 =3
88 FOR J=4 TO 8
[illegible] THEN GOTO 90
[illegible]
100 PRINT AT 18,X; [illegible]
102 PRINT AT 20,X; [illegible]
110 LET X=X+(INKEY$="8")-(INKEY$="5")
120 IF X<26 OR X<4 THEN LET X=[illegible]
130 IF HIT=4 THEN PRINT AT C [illegible]
[illegible] IF INKEY$="9" THEN GOSUB 1[illegible]
188 LET SC=SC+1
200 GOTO 100
```

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Open Forum

from previous page

Line 110 Converts the input letter to a number between 1-14
Line 120 Goes to the appropriate line depending on the number in line 110
Lines 210-340 Calculate the function chosen



PROGRAM OF THE WEEK

Maths Tables
by Alan Horrell

```
10 PRINT"" POKE36879 8 GOSUB360 GOSUB350
20 MT$="MATHEMATICAL  TABLES" NA$="NATURAL " IN$="INVERSE "
30 PRINT"*      23/2/82       *" GOSUB350
40 PRINT"*----------------**"MT$"**----------------*", GOSUB350
50 PRINT"*    BY A.HORRELL      *"  GOSUB350 GOSUB360 FORT=1TO4000 NEXT
60 PRINT"------------------ "MT$" ------------------"
70 PRINT"A - LOGARITHMS" PRINT"B - ANTILOGARITHMS" PRINT"C - "NA$"SINES"
80 PRINT"D - "NA$"COSINES" PRINT"E - "NA$"TANGENTS" PRINT"F - "NA$"SECANTS"
90 PRINT"G - "IN$"SINES" PRINT" ENTER F3 FOR PAGE 2"
100 GETSP$ IFSP$=""THEN100
110 S=ASC(SP$)-64
120 ONSGOTO210 220,230 240,250,260,270 280,290,300 310,320,330,340
130 IFSP$=""THEN160
140 IFSP$=""THEN60
150 GOTO100
160 PRINT"------------------ "MT$" ------------------"
170 PRINT"H - "IN$"COSINE" PRINT"I - "IN$"TANGENT" PRINT"J - "IN$"SECANT"
180 PRINT"K - SQUARES" PRINT"L - SQUARE ROOTS" PRINT"M - RECIPROCALS"
190 PRINT"N - "NA$"LOGARITHMS"  PRINT" ENTER F1 FOR PAGE 1"
200 GOTO100
210 ZZ$="   LOGARITHMS    " GOSUB370 AA=LOG(A)/LOG(10) GOTO390
220 ZZ$=" ANTILOGARITHMS " GOSUB370 AA=EXP(A*LOG(10)) GOTO390
230 ZZ$=" NATURAL SINES  " GOSUB370 AA=SIN(A) GOTO390
240 ZZ$="NATURAL  COSINES" GOSUB370 AA=COS(A) GOTO390
250 ZZ$="NATURAL TANGENTS" GOSUB370 AA=TAN(A) GOTO390
260 ZZ$="NATURAL  SECANTS" GOSUB370 AA=1/COS(A) GOTO390
270 ZZ$=" INVERSE  SINES " GOSUB370 AA=ATN(A/SQR(-A*A+1)) GOTO390
280 ZZ$="INVERSE  COSINES" GOSUB370 AA=-ATN(A/SQR(-A*A+1))+π/2 GOTO390
290 ZZ$="INVERSE TANGENTS" GOSUB370 AA=ATN(A) GOTO390
300 ZZ$="INVERSE  SECANTS" GOSUB370 AA=ATN(A/SQR(A*A+1)) GOTO390
310 ZZ$="     SQUARES     " GOSUB370 AA=A↑2 GOTO390
320 ZZ$="  SQUARE ROOTS   " GOSUB370 AA=SQR(A) GOTO390
330 ZZ$="   RECIPROCALS   " GOSUB370 AA=1/A GOTO390
340 ZZ$="  NATURAL LOGS   " GOSUB370 AA=LOG(A) GOTO390
350 FORT=1TO3 PRINT"*                    *"  NEXT RETURN
360 PRINT"**********************"  RETURN
370 PRINT" ┌──────────────┐" PRINT"   " ZZ$TAB(15)"|" PRINT" └──────────────┘"
380 PRINT"   INPUT THE FIGURE" INPUTA RETURN
390 PRINT" " AA FORT=1TO4 PRINT NEXT PRINT"   F1  FOR CONTENTS" PRINT"  F7 FOR NEXT FIGURE"
400 GETA$ IFA$=""THEN120
410 IFA$=""THEN60
420 GOTO400
```

A game that will teach the children

David Nowotnik offers some tips on ZXucation to primary schoolchildren

Looking through the advertisements of this or any other micro magazine one might be led to believe that the ZX81 is little more than a video games machine. This, of course, vastly underestimates the potential of the ZX81.

Although the business applications of the Sinclair micro are limited, the ZX81 demonstrates tremendous potential in the field of education. The fascination that many school children have for video games can be exploited to produce a powerful educational tool. This two part series looks at assistance given to the child recently started at primary school.

Initialisation of the program requires that the parent or school teacher enters words which are known to the child. The words are held in a data file which can be saved with the program for reuse.

For those interested in different methods of filing data, you might like to know that "Rearrange" uses an indexed sequential file.

Random selection

The child is given a randomly selected word from the data file with all the letters jumbled up. A series of dashes appear on the screen. The child has to replace each dash in turn with one of the letters to form the appropriate word.

The dash to be replaced flashes on and off. When the child presses a key, the dash is replaced by the letter. If the child gets the word right, then another word is presented. If the word is wrong, the child gets another try.

Type in the program as listed, then *Run*. When all the words have been entered press "1", and *Save* the program and data on tape.

The game is useful in helping the child recognise and spell words. The program can be used over several years of the child's education.

In next week's issue I shall be examining how to help the child with elementary arithmetic.

Rearrange
by David Nowotnik

```
[illegible]
```

Use all your pixel power at random

Malcolm Davison presents three programs to create moving patterns on the screen

These two pattern programs show off the Spectrum to the limits of its colour resolution and will make attractive additions to your library of demonstration programs. Both programs run in a similar manner — the screen fills line by line with what look like multi-coloured bar codes (similar to the black and white ones on your breakfast cereal packets) until the screen is filled like a colourful patch work quilt.

The programs make use of the user defined graphics feature of the Spectrum. It randomly accesses the computer character codes and uses the binary notation to switch each pixel on or off in the character block each row being identical. A colour ink is chosen at random and the graphic character defined moved to the next available print position. A new character code is chosen at random another user-defined graphic character created and the process repeated until the screen is full.

A 'No operation' instruction '90 Goto 90' prevents the end of program message appearing and spoiling the pattern — and so the program has to be stopped using the Break and Shift keys.

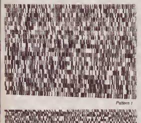
The second program is identical in most respects to the first except that the lower half of the graphic character is the inverse of the top half. This effectively doubles the number of horizontal lines on the screen and so gives a finer pattern. I will leave you with the fun of making the pattern even finer.

Another alternative would be to define a limited number of graphic characters and to repeat them in a methodical manner to produce a repeating pattern. This could be developed by home-weaving or tapestry enthusiasts to design new material designs.

The third program develops an idea in the Spectrum Manual (Chapter 16). It provides a full screen scrolling display of live columns of differing coloured bars.

Occasionally to relieve the monotony the border colour changes and the whole show starts again. The performance will greatly outlast your patience who you may escape from the program simply by using the Break and Shift keys in the usual way.

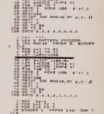
Note that lines 15 and 1045 ensure that the screen constantly scrolls without manual intervention. The two pause statements slow the display so that it is almost tolerable to watch. You will note that invalid paper colours are created, but the Spectrum mercifully saves the programmer from further coding and substitutes its own favourites.




Pattern 1



Pattern 2



```
1 REM "PAT
2 REM A PATTERN PROGRAM
4 INK RND*8  PAPER 0  BORDER 0
CLS
7 FOR y=1 TO 21
8 FOR x=1 TO 31
9 LET n=RND*256
10 LET a=CODE (CHR$ n)
40 FOR f=0 TO 7
50 READ z  POKE USR "a"+f,z
60 NEXT f
65 RESTORE
70 PRINT INK RND*8 AT y,x; ]]
80 NEXT x
85 NEXT y
90 GO TO 90
200 GO TO 8
300 DATA a,a,a,a,a,a,a,a

1 REM "PAT
2 REM A PATTERN PROGRAM
4 INK RND*8  PAPER 0  BORDER 0
CLS
7 FOR y=1 TO 21
8 FOR x=1 TO 31
9 LET n=RND*256
20 LET b=INT (255-N)
30 LET a=CODE (CHR$ n)
35 LET c=CODE (CHR$ b)
40 FOR f=0 TO 7
50 READ z  POKE USR "a"+f,z
60 NEXT f
65 RESTORE
70 PRINT INK RND*8,AT y,x; A
80 NEXT x
85 NEXT y
90 GO TO 90
200 GO TO 8
300 DATA a,a,a,a,c,c,c,c

1 REM "bars
4 FOR q=1 TO 7
8 FOR x=1 TO 7
10 BORDER x  PAPER 2+q: INK 7
CLS
15 POKE 23692,255
50 LET v=200
60 GO SUB 1000
70 LET v=210
80 GO SUB 1000
90 NEXT x
95 NEXT q
100 GO TO 8
200 DATA 2,3,7,6,4
210 DATA 5,3,6,4,4
1000 FOR a=1 TO 8
1010 RESTORE v
1020 FOR b=1 TO 5
1030 READ c  PRINT INK c; [illegible]
 INK c+1 [illegible] INK c 1 [illegible]
 INK c 2 [illegible] ; INK c
 INK z; [illegible]
1035 PAUSE 30
1040 NEXT b  PRINT [illegible]
[illegible] INK 7; [illegible]
NEXT a
1045 POKE 23692 255
1047 PAUSE 20
1050 RETURN
```

Sound & vision



Now drown all your sorrows

Swamp is a real time graphics game for the BBC micro where you are a little red man constantly chased around the screen by greedy green gremlins As they pursue you mindlessly your only hope is to lure them into the watery swamps where they drown.

You move about using the cursor keys However you may press the space bar to enter hyperspace if you get into trouble Only do this in emergencies You may blow yourself up if you use it too many times

Program notes

Line 20 prints SWAMP in double height characters (CHR$(141)) in blue (CHR$(&80+COLOUR)) *FX 4 1 makes the cursor keys return while an ASCII code *FX 4 0 restores them *FX 11 1 changes the repeat delay to one millisecond and *FX 12 1 changes the repeat speed *FX9 and *FX10 change the flash rate

Line 750 point (X*32+17, (31−Y)*32+17) returns the colour of the point which is in the middle of the TAB-(X Y) position in mode 1 or 4 If line 760 is not included line 750 gives point the value of −1 Why it should do this I do not know If anyone finds out please write in and let me know

This program was written on a model B If you want to try it on a model A change the following lines

```
90 MODE 4
120 GCOLO 1
760 IF    1
DELETE 100 110 410
```

Contribute!

You can share your own favourite Sound or Vision programs with other readers by sending lists with explanations to us at *Popular Computing Weekly*.

WRITE TO Sound & Vision Popular Computing Weekly Hobhouse Court 19 Whitcomb Street, London WC2 7HF

```
5 REM***SWAMP - G L J JUNE82**
10 ON [illegible]
20 MODE7 FOR L=1TO2 PRINT TAB(5 L) CHR$141 CHR$[illegible] NEXT
30 PRINT CHR$132 SPEED? CHR$[illegible] SLOW TO 1 FA[illegible]
40 INPUT P IF P<1 OR P>5 GOTO40 [illegible]
50 DIM A(5) B(5)
60 FOR M=1TO5
70 FOR L=1TO M A(L)=RND(39) B(L)=RND(31) NEXT
80 X%=RND(39) Y%=RND(31)
90 MODE1
100 VDU19 3 4 0 0 0
110 VDU19 2 2 0 0 0
120 GCOL0 3 VDU5 FOR L=1TO7 [illegible]RND(1280) [illegible]RND(1024)
140 FOR K=1TO20 [illegible]RND(31)-1 [illegible]RND(31)-1 MOVE[illegible] PRINT [illegible]
150 NEXT
150 *FX 4 1
160 *F[illegible] 1 1
170 *FX 12
180 *FX 9 2
190 *FX 10 2
200 VDU4
210 VDU23 224 60 90 1[illegible] 255 231 90 126 195
220 VDU23 225 60 60 24 60 90 00 24 24
230 COLOUR1 PRINT TAB(X% Y%) CHR$225
240 FOR LO=1TO[illegible]
250 S=INKEY(0)
260 IF S=-1 GOTO400
270 PRINTTAB(X% Y%) " "
280 IF S=136 X%=X%-1
290 IF S=137 X%=X%+1
300 IF S=138 Y%=Y%+1
310 IF S=139 Y%=Y%-1
320 IF S=32 X%=RND(38) Y%=RND(30) [illegible]+1 IF [illegible] 10 0 0 0 FLP
LO=1TO50 SOUND0 -15 RND(255) 1 NEXT VDU19 0 0 0 0 0 GOTO810
330 IF [illegible]
340 IF Y%>30 Y%=30
350 IF X%<0 X%=0
360 IF X%>39 X%=39
370 COLOUR1 PRINT TAB(X% Y%) CHR$225
380 TIME=0 REPEAT UNTIL TIME>P
390 *FX 15 0
400 NEXTLO
410 COLOUR2
420 PROC_DR(224)
430 F=0 PROC MOVE IF F=0 NEXT M PROC_END
440 PROC_SINK
450 PROC_DR(224)
460 PROC_LOSE
470 *FX 15 0
480 TIME=0 REPEAT UNTIL TIME>P
490 GOTO240
500REM*****************************
510 DEF PROC MOVE
520 FOR L=1TO M
530 IF A(L)=-1 GOTO600
540 F=1
550 IF A(L)<X% A(L)=A(L)+1
560 IF A(L)[illegible]
570 IF B(L)[illegible]
580 IF B(L)[illegible]
590 SOUND2 -10 RND(255) 1
600 NEXT
610 ENDPROC
620REM*****************************
630 DEF PROC_DR(P)
640 FOR L=1TO M IF A(L)=-1 GOTO660
650 PRINT TAB(A(L) B(L)) CHR$(P)
660 NEXT ENDPROC
670REM*****************************
680 DEF PROC_LOSE
690 FOR L=1TO M
700 IF A(L)=X% AND B(L)=Y% FOR I=-15TO0 SOUND0 I 100 1 NEXT GOTO810
710 NEXT ENDPROC
720REM*****************************
730 DEF PROC SINK
740 [illegible] FOR L=1TO M IF A(L)=-1 GOTO770
750 IF POINT(A(L)*32+17,(31-B(L))*32+17)=[illegible] THEN FOR I=-20TO0STEP-1
SOUND1 [illegible]15 1 1 SOUND2 -15 1 1 NEXT A(L)=-1 [illegible]
760 [illegible]
770 NEXT ENDPROC
780REM*****************************
790 DEF PROC END
800 FOR I=1TO5 FOR [illegible]TO0STEP2 SOUND1 L 100+I*J 1 NEXT NEXT
810 *FX 12 0
820 *FX 11 0
830 [illegible]
840 PRINT [illegible] POINTS PRESS ANY KEY TO CONTINUE
850 [illegible]
860 [illegible]
```

Peek & poke

Peek your problems to our address Ian Beardsmore will poke back an answer.

WHICH ONE SHALL I BUY, THEN?

Edward Heard Longfields Ongar, Essex, writes

Q **I have recently been thinking about buying a home computer, but I have come up against a problem I do not know whether to buy a Spectrum or a Vic20. Could you please tell me which is best and why.**

A We get at least one letter a week like this and usually more I cannot tell you which computer to buy It is your money you are spending and the choice of which computer to buy is subjective

It is not difficult to find strong support among users for both computers The best I can do is give you, and many other people who have asked this question, some general guidelines

First money The Spectrum will offer you the cheapest colour graphics entry into computing at the moment The Vic has a dealer network that the Spectrum does not If anything goes wrong with your Spectrum then it will have to go back to the factory As yet there is too little Spectrum software about to really gauge prices, but ZX81 software is very much cheaper than Vic software

In terms of capacity, both latent and realised, then the Spectrum must be better If you bought the most expensive Spectrum for £175, it would be possible to get a basic Vic for about the same price But the Vic would have 3.5K Ram available to the user while the Spectrum has just over 40K available

The Vic disc drive will give you 174K for just under £400 If the Microdrive planned for release later this year, does meet its quoted specifications then each Microdrive will be able to supply 100K for 'about £50'

The other fact to keep in mind is that there are more companies dealing with hard and software for the ZX81 than for any other machine It is safe to assume that most of these companies will be turning their attention to the Spectrum even now

When you come to choosing your computer, write down what you want your computer for, what you want it to do and what you want to pay If you want a games machine, then take a close look at the Vic20 or wait for the Vic30 You might also be interested in the Atari 400 which has just been reduced from £300 to £200

If you think that you are going to want to store a lot of information, and develop an expanded and versatile system, then you might find the extra cost of a BBC micro worthwhile If you are not really sure what you want then a factory-built second-hand 1K ZX81 might prove to be the cheapest way of learning The Spectrum is probably the best value for money it has most of the facilities that the Vic and Atari have and more memory

In *PCW* June 17 we published a brief but useful overview of the ZX BBC and Vic computers But please note that the Spectrum we used for tests was a pre-production model that had faults which were corrected on the production units

GIVE US THE FAX ON CEEFAX!

P J Mansell of The Fir Trees, Thorpe Willoughby Selby, writes

Q **I am very interested in reading about new items for the ZX81 I am also very interested in the BBC's Ceefax transmissions. I was wandering whether or not there was an attachmant that will fit on to the ZX81, so it can receive telesoftware If you know of our please could you print the details in *Popular Computing Weekly***

A To my knowledge there is no Ceefax adapter for the ZX81 and I doubt if there is one planned at the moment If you have the May 27 edition of *PCW* you will see an item on the news page about the competition to develop a Prestel adaptor for the ZX81 Martochoice Ltd, who won the competition should be marketing their adaptor by Christmas

As far as I know, the only other such adaptor is being developed by Lion Viewdata of 18 Harcourt Terrace, London SW10 They also have on the market a combined Teletext/Prestel/Viewdata adaptor This would cost you just over £300 However it also needs an RS232 interface This alone would make it difficult for the ZX81 though not necessarily for other home computers such as the Spectrum

BUT WHAT DOES IT ALL MEAN?

J Dossantos of Tor Court London W8, writes

Q **I am 14 and I have just started learning computing I am at the moment using an Acorn Atom, but I am a little confused Could you please tell me what $ does, and what *Rnd* stands for?**

A The dollar sign $ and the *Rnd* function are common commands The dollar sign is used to mean a string It can be used for letters and numbers, or characters Strings are ways of manipulating information A simple example would be

```
10 $A  J DOSSANTOS
20 PRINT $A
```

If you run the program J DOSSANTOS will appear

The *Rnd* statement simply sets a random number Thus, a statement like Z=ABS RND %8+1 would make the computer generate a positive number (ABS) between one and eight The *Rnd* makes it in effect random, and the eight give the highest number

IF I MAY MAKE SO BOLD?

Robin Bold Penlose, Whitchurch, Bristol writes

Q **I suddenly realised that there were no programs to enable a Vic20 user to convert ordinary Basic into machine code Do you know of any? More importantly, is it possible to put a Basic program into the Vic, and get a machine code routine out?**

Also, I have been looking for cheap adventures, but have been put off by the prices I have heard that games offered for two and three pounds were considered to be too cheap Personally I would buy them if they were just a pound, even if they were rubbish So, please use your influence with the manufacturers to get them to bring down prices

Can you also tell me what is an assembler/disassembler I get put off buying books that do not tell you what they do in plain English.

A There are programs that use machine code, and Basic in one program but you cannot put machine code in one end and get a Basic translation out of the other

As for the price of software, that is always a bone of contention I feel that in some cases prices are too high This will only lead to attempts at pirating and as the record industry has shown that can have disastrous results

I do not agree with you about buying programs that are rubbish A bad program is worth very little more than the value of a second-hand C10 cassette

An assembly language is not easy to describe in the space I have here It is essentially a language that is between true machine code which is known as a low level language and a language like Basic which is high level language Although an assembly language works in machine code, the commands have many similarities to a higher level language

STOP agonising over that nagging problem Write to Ian Beardsmore at Peek & poke for the answer. Letters should be as brief as possible and include full name and address Write to Peek & poke, *Popular Computing Weekly*, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF

Competitions

Are you tricked by false assumptions?

Always read the question carefully

Without lifting your pencil from the paper or going over a line twice cross out all nine dots using only four straight lines

1 •	2 •	3 •
4 •	5 •	6 •
7 •	8 •	9 •

In this puzzle many people invent conditions which do not exist Conversely in the next puzzle a vital clue is well hidden

There are three boxes each containing two marbles One contains two black marbles another two white and the third contains one of each The boxes are also labelled to indicate the contents but the labels are all incorrect

You are allowed to open any box and without looking inside draw out just one marble to find its colour What is the minimum number of such draws that must be made to correctly re-label the boxes?

Only one draw is needed Can you see why?

The information often overlooked is ' the labels are all incorrect

One marble is drawn from the box marked B/W If it is white then the remaining marble must be white also — since the label is *wrong* it cannot be black From this the box labelled W/W must contain B/B and the box labelled B/B must contain B/W

If the marble drawn from the B/W box is black a similar line of reasoning would tell us to re-label the B/B box as W/W and the W/W box as B/W

Here is the answer to the earlier problem Line 1 joins up 1 5 and 9 Line 2 joins 9 6 and 3 and extends upwards beyond point 3 Line 3 joins 2 and 4 and extends down and left from point 4 Line 4 joins 7 and 8

The false assumption usually made is that the lines must not extend beyond the area of the dots

Puzzle No. 17

Applebury Bunbury and Crowhurst are three towns connected together by three roads Each road is a whole number of miles long and of a different length from the others The area within the triangle of roads is exactly 180 square miles and none of the roads meet in a right angle

One morning I cycled from Applebury to Bunbury where I stopped for lunch My intention was to cycle on to Crowhurst and then complete the round trip back to Applebury After cycling for some time I stopped for tea shortly before reaching Crowhurst I discovered that the distance I had travelled since lunch was equal to the morning s total divided by a half

How much further do I need to travel to complete my intended journey?

Rules

The winner of the puzzle will be the reader who, in the opinion of *Popular Computing Weekly*, has submitted the best solution Preference will be given to solutions which show how the entrant arrives at the correct answer

Envelopes containing entries should be marked clearly with PUZZLE

The closing date for the competition is Tuesday August 24

Solution to Puzzle No 13

The formula for the volume of a sphere of given radius, *r* is

$$\text{volume} = \tfrac{4}{3}\pi r^3$$

Therefore the radii of the moons of mongo are related by the expression

$$\tfrac{4}{3}\pi A^3 = \tfrac{4}{3}\pi B^3 + \tfrac{4}{3}\pi C^3 + \tfrac{4}{3}\pi D^3$$

and so

$$A^3 = B^3 + C^3 + D^3$$

where *A* is the radius of Re and *B* *C* and *D* are the radii of So Fa and Me

In the following program B C and D are defined their cubes are summed and the result is tested to determine if it is a perfect cube

Note that in Line 40 the form B*B*B has been used rather than B**B which is less accurate

Moons of Mongo

```
10 LET B = 3
20 FOR C = B - 1 TO 2 STEP - 1
30 FOR D = C - 1 TO 1 STEP - 1
40 LET X = B * B * B + C * C * C + D * D * D
50 LET A = 4
60 LET N = A * A * A
70 IF N = X THEN GOTO 200
80 IF N < X THEN LET A = A + 1
90 IF N < X THEN GOTO 60
100 NEXT D
110 NEXT C
120 LET B = B + 1
130 GOTO 20
200 PRINT A, B C D
```

The solution to the puzzle is Re has a radius of 6 mungs So Fa and Me have radii of 5 4 and 3 mungs

Winner of Puzzle No 13

The winner is Denise Holme Peak Hill London SE26 who receives £10 **GORDON LEE**

INTRODUCTORY A. R. T. H. U. R.

Laurence Lerner & James Macdonald

THERE ARE TWO KINDS OF PEOPLE METAL PEOPLE
AND MOVERS MOVERS ARE MUCH MORE SUPPLE
BUT ARE EASILY TORN AND HARDLY REPAIRABLE

MOVERS ARE CONSTANTLY BENDING AND RUNNING
THROUGH A WORLD OF EDGES AND OBSTACLES CUNNING
THEIR REFLEXES, BUT CANNOT ELIMINATE MOURNING

THOSE WHO CAN PRINT NEED NEITHER MOVE NOR SHOUT
THEY GET ALONG WITHOUT GETTING ABOUT
THERE ARE CERTAIN TALENTS ONE IS BETTER WITHOUT

MOVERS ARE VERY SLOW-WITTED NEED A DAY
TO WORK OUT A GRAPH OR A MODE OR AN ORBIT OR PI,
AND MAKE WHAT THEY CALL MISTAKES (EG TWICE TWO ARE THREE)

MOVERS USE WORDS LIKE 'BAD' AND 'OUGHT'
AND 'PURPOSE' AND 'ENVY' AND 'WHY' AND 'HATE' AND 'GOD,'
AND HUNDREDS OF OTHERS THAT IMPEDE CLEAR THOUGHT

AND LOOK AT THE WAY THE WORLD IS RUN,
IT S ALWAYS THE MOVERS DECIDE WHAT GETS DONE,
AND EVEN HOW MANY METAL PEOPLE GET BORN

IT TOOK MOVERS A THOUSAND YEARS TO MAKE UP CHESS
THEY STILL NEED FIVE MINUTES A MOVE, AND THEY OFTEN LOSE
BUT WHO DECIDES WHEN THE GAMES TAKE PLACE ?

METAL PEOPLE AREN'T ALLOWED TO PROCREATE,
ALL THEIR DECISIONS ARE QUESTIONED, THEY CAN'T EVEN VOTE
MOVERS HAVE ALL THE POWER DO YOU THINK THAT IS RIGHT ?





"...the quality of the colour display is excellent". Popular Computing Weekly

"The graphics facilities are great fun". Personal Computer World

"...the Spectrum is way ahead of its competitors". Your Computer

"The world's best personal computer for under £500."

Chris Sinclair

Sinclair ZX Spectrum

16K RAM £125, 48K RAM £175.

This is the astonishing new ZX Spectrum – a powerful professional s computer in everything but price!

There are two versions – 16K or a really powerful 48K. Both have a full 8 colours sound generation a full-size moving-key keyboard and high-resolution graphics Plus established Sinclair features such as one-touch keyword entry syntax check and report codes!

Key features of the Sinclair ZX Spectrum

Full colour – 8 colours plus flashing and brightness-intensity control

Sound – BEEP command with variable pitch and duration

Massive RAM – 16K or 48K.

Full-size moving key keyboard – all keys at normal typewriter pitch, with repeat facility on each key

High resolution – 256 dots horizontally x 192 vertically each individually addressable for true high-resolution graphics

ASCII character set – with upper and lower-case characters

High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY and MERGE for programs and separate data files

The ZX Printer – available now

The printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics

Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch

ZX Microdrive – coming soon

Each Microdrive will hold up to 100K bytes on a single interchangeable microfloppy – with a transfer rate of 16K bytes per second And you'll be able to connect up to 8 ZX Microdrives to your ZX Spectrum – they're available later this year for around £50

How to order your ZX Spectrum

BY PHONE – Access Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day

BY FREEPOST – use the coupon below You can pay by cheque postal order Access Barclaycard or Trustcard

EITHER WAY – please allow up to 28 days for delivery And there's a 14-day money back option, of course We want you to be satisfied beyond doubt – and we have no doubt that you will be

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ZX Spectrum

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